

Application Serial No.: 10/724,430
Attorney Docket No.: 0140114

List of Claims:

Claim 1 (Previously Presented): A method for suppressing noise in a source speech signal, said method comprising:

calculating a signal-to-noise ratio in said source speech signal;

calculating a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said calculating said signal-to-noise ratio is carried out independent from said background noise estimate for said current frame;

calculating an over-subtraction parameter based on said signal-to-noise ratio;

calculating a noise-floor parameter based on said signal-to-noise ratio; and

subtracting said background noise estimate from said source speech signal based on said over-subtraction parameter and said noise-floor parameter to produce a noise-reduced speech signal.

Claim 2 (Previously Presented): The method of claim 1 further comprising: updating said background noise estimate at a faster rate for noise regions than for speech regions.

Claim 3 (Previously Presented): The method of claim 2, wherein said noise regions and said speech regions are identified based on said signal-to-noise ratio.

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Claim 4 (Previously Presented): The method of claim 1, wherein said over-subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 5 (Previously Presented): The method of claim 4, wherein said over-subtraction parameter is about zero.

Claim 6 (Previously Presented): The method of claim 1, wherein said noise-floor parameter is configured to control noise fluctuations, level of background noise and musical noise.

Claim 7 (Previously Presented): A noise suppressor for suppressing noise in a source speech signal, said noise suppressor comprising:

a first element configured to calculate a signal-to-noise ratio in said source speech signal;

a second element configured to calculate a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said first element calculates said signal-to-noise ratio independent from said background noise estimate for said current frame;

a third element configured to calculate an over-subtraction parameter based on said signal-to-noise ratio;

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a fourth element configured to calculate a noise-floor parameter based on said signal-to-noise ratio; and

a fifth element configured to subtract said background noise estimate from said source speech signal based on said over-subtraction parameter and said noise-floor parameter to produce a noise-reduced speech signal.

Claim 8 (Previously Presented): The noise suppressor of claim 7, wherein said background noise estimate is updated at a faster rate for noise regions than for speech regions.

Claim 9 (Previously Presented): The noise suppressor of claim 8, wherein said noise regions and said speech regions are identified based on said signal-to-noise ratio.

Claim 10 (Previously Presented): The noise suppressor of claim 7, wherein said over-subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 11 (Previously Presented): The noise suppressor of claim 10, wherein said over-subtraction parameter is about zero.

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Claim 12 (Previously Presented): The noise suppressor of claim 7, wherein said noise-floor parameter is configured to reduce noise fluctuations, level of background noise and musical noise.

Claim 13 (Previously Presented): A computer software program stored in a computer medium for execution by a processor to suppress noise in a source speech signal, said computer software program comprising:

code for calculating a signal-to-noise ratio in said source speech signal;

code for calculating a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said code for calculating said signal-to-noise ratio is carried out independent from said background noise estimate for said current frame;

code for calculating an over-subtraction parameter based on said signal-to-noise ratio;

code for calculating a noise-floor parameter based on said signal-to-noise ratio;
and

code for subtracting said background noise estimate from said source speech signal based on said over-subtraction parameter and said noise-floor parameter to produce a noise-reduced speech signal.

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Claim 14 (Previously Presented): The computer software program of claim 13 further comprising: code for updating said background noise estimate at a faster rate for noise regions than for speech regions.

Claim 15 (Previously Presented): The computer software program of claim 14, wherein said noise regions and said speech regions are identified based on said signal-to-noise ratio.

Claim 16 (Previously Presented): The computer software program of claim 13, wherein said over-subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 17 (Previously Presented): The computer software program of claim 16, wherein said over-subtraction parameter is about zero.

Claim 18 (Previously Presented): The computer software program of claim 13, wherein said noise-floor parameter is configured to reduce noise fluctuations, level of background noise and musical noise.

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Claim 19 (Currently Amended): A method for suppressing noise in a source speech signal, said method comprising:

calculating a signal-to-noise ratio in said source speech signal;

calculating a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said calculating said signal-to-noise ratio is carried out independent from said background noise estimate for said current frame; and

calculating an over-subtraction parameter based on said signal-to-noise ratio;

subtracting said background noise estimate from said source speech signal based on said over-subtraction parameter to produce a noise-reduced speech signal.

Claim 20 (Previously Presented): The method of claim 19 further comprising: updating said background noise estimate at a faster rate for noise regions than for speech regions.

Claim 21 (Previously Presented): The method of claim 20, wherein said noise regions and said speech regions are identified based on said signal-to-noise ratio.

Claim 22 (Cancelled)

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Claim 23 (Currently Amended): The method of claim ~~22~~ 19, wherein said over-subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 24 (Currently Amended): The method of claim ~~22~~ 19, wherein said over-subtraction parameter is less than one.

Claim 25 (Previously Presented): The method of claim 19 further comprising: calculating a noise-floor parameter based on said signal-to-noise ratio.

Claim 26 (Previously Presented): The method of claim 25, wherein said noise-floor parameter is configured to reduce noise fluctuations, level of background noise and musical noise.

Claim 27 (New): A noise suppressor for suppressing noise in a source speech signal, said noise suppressor comprising:

a first element configured to calculate a signal-to-noise ratio in said source speech signal;

a second element configured to calculate a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said first element

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calculates said signal-to-noise ratio independent from said background noise estimate for said current frame;

a third element configured to calculate an over-subtraction parameter based on said signal-to-noise ratio;

a fourth element configured to subtract said background noise estimate from said source speech signal based on said over-subtraction parameter to produce a noise-reduced speech signal.

Claim 28 (New): The noise suppressor of claim 27, wherein said background noise estimate is updated at a faster rate for noise regions than for speech regions.

Claim 29 (New): The noise suppressor of claim 28, wherein said noise regions and said speech regions are identified based on said signal-to-noise ratio.

Claim 30 (New): The noise suppressor of claim 27, wherein said over-subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 31 (New): The noise suppressor of claim 27, wherein said over-subtraction parameter is less than one.

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Claim 32 (New): The noise suppressor of claim 27 further comprising: a fifth element configured to calculate a noise-floor parameter based on said signal-to-noise ratio for use by said fourth element.

Claim 33 (New): The noise suppressor of claim 32, wherein said noise-floor parameter is configured to reduce noise fluctuations, level of background noise and musical noise.

Claim 34 (New): A computer software program stored in a computer medium for execution by a processor to suppress noise in a source speech signal, said computer software program comprising:

code for calculating a signal-to-noise ratio in said source speech signal;

code for calculating a background noise estimate for a current frame of said source speech signal based on said current frame and at least one previous frame and in accordance with said signal-to-noise ratio, wherein said code for calculating said signal-to-noise ratio is carried out independent from said background noise estimate for said current frame;

code for calculating an over-subtraction parameter based on said signal-to-noise ratio; and

code for subtracting said background noise estimate from said source speech signal based on said over-subtraction parameter to produce a noise-reduced speech signal.

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Claim 35 (New): The computer software program of claim 34 further comprising:
code for updating said background noise estimate at a faster rate for noise regions than for
speech regions.

Claim 36 (New): The computer software program of claim 35, wherein said noise
regions and said speech regions are identified based on said signal-to-noise ratio.

Claim 37 (New): The computer software program of claim 34, wherein said over-
subtraction parameter is configured to reduce distortion in noise-free signal.

Claim 38 (New): The computer software program of claim 34, wherein said over-
subtraction parameter is less than one.

Claim 39 (New): The computer software program of claim 34 further comprising:
code for calculating a noise-floor parameter based on said signal-to-noise ratio.

Claim 40 (New): The computer software program of claim 39, wherein said noise-
floor parameter is configured to reduce noise fluctuations, level of background noise and
musical noise.